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NOTES ON THE YOUNG
OF THREE RECENTLY DESCRIBED SNAKES,
WITH COMMENTS UPON THEIR RELATIONSHIPS

By

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Considerable information on the eggs and young of reptiles, based chiefly upon specimens living in the collection of the Zoological Society of Philadelphia, has been published in a recent paper (Conant and Downs, 1940). Since then numerous additional data have been accumulated—on the same subject and from the same source—most of which are to appear in a lengthy report on the breeding habits of snakes, now in preparation. In a few instances, however, the information at hand is of sufficient interest, largely because it gives clues to the relationships of recently described snakes, to be worthy of immediate publication.

All eggs, as soon as they were discovered, were placed in terrariums partially filled with decaying wood, and were kept at ordinary room temperatures until hatched. Measurements and weights of eggs and young were recorded as soon after laying, hatching or birth as was possible, usually within a matter of a few hours.

Coluber constrictor priapus Dunn and Wood

Seven eggs of this racer were found May 14, 1941, in a cage containing a number of adults, all of which had been collected five miles south of Brighton, Glades County, Florida, by J. T. Sackett, a few days previously. It was not determined which female laid the eggs, but it was presumed that all of them belonged to the same clutch. Measurements and weights were:

	<i>Length, mm.</i>	<i>Width, mm.</i>	<i>Weight, g.</i>
	50.0	16.3	8.1
	47.7	17.4	9.2
	45.7	18.2	9.4
	44.7	18.4	9.6
	44.5	18.6	8.7
	40.9	18.6	8.5
	39.7	18.1	8.2
Average	44.7	17.9	8.8

All the eggs were non-adherent and covered with coarse granulations. Four spoiled but the others hatched between August 10 and August 14 (inclusive). Measurements and weights of the young were:

	<i>Length, mm.</i>	<i>Weight, g.</i>
	332	7.1
	320	5.2
	248	4.7
Average	300	5.7

The first two of these young were normal in appearance but the last was obviously deformed. Its tail was kinked and twisted at the end, and the posterior part of the body bore a large "bump" along the spine. Many of the ventral scutes were double and otherwise malformed. All three snakes bore egg teeth until two or three days after hatching. One shed its skin August 23, another on August 30, and the last on September 2.

All were brightly colored, the entire general tone being decidedly reddish. In life they were as follows: dorsal blotches rich chestnut

brown; lateral ground color light bluish grey; spots on belly orange brown; ground color of belly (posteriorly) bright pinkish orange; iris red (Brazil Red*); pupil black.†

The hatching of a clutch of eggs of *Coluber c. constrictor* a few weeks later afforded an excellent opportunity to compare the young of that form with the young of *priapus*. Fourteen eggs were laid June 23, 1941, by a female caught near Philadelphia, Pennsylvania; ten of these hatched on August 30. The eggs, when laid, varied in length from 30.4 to 37.5 mm. (average 33.4); in width from 18.3 to 20.7 mm. (average 19.6); and in weight from 6.9 to 7.9 g. (average 7.4). The young varied in length from 245 to 287 mm. (average 268.9); and in weight from 4.3 to 5.8 g. (average 5.2). The female *constrictor* weighed 253.7 g. and measured approximately 1177 mm. (part of the tail was missing) immediately after laying. Nine of the young were preserved.‡

The juvenile specimens of *constrictor* were distinguishable at a glance from the young *priapus*, and they still can be separated readily after several months of preservation. They are quite dark and much more dull in appearance. In life they were: dorsal blotches dark brown; lateral ground color medium bluish grey; spots on belly very dark brown or black; ground color of belly bluish grey, darker posteriorly; iris very dark brown; pupil black.

Many adult racers from Florida, as first pointed out to me by Coleman J. Goin, of the University of Florida, have red or orange eyes. They thus agree in this characteristic with the juveniles of *priapus* described above. Live individuals of *constrictor* which I recently have seen from Pennsylvania, New Jersey, Delaware, Maryland and Virginia, all have brown eyes. The eye color may thus afford an additional means of identifying *priapus*. In describing this subspecies, Dunn and Wood (1939) based it entirely upon the hemipenial characters exhibited by a small series of specimens in the Academy of Natural Sciences of Philadelphia. Thus they did not designate any means of identifying females or live specimens.

Since the natural color of the eye fades rapidly in preservatives, notes on live specimens are greatly to be desired. To date *priapus* is known only from Florida but the exact limits of its range remain to be determined.

*Ridgway: Color Standards and Color Nomenclature, 1912.

†These snakes are now numbers 10989-91 in the collection of the Chicago Academy of Sciences.

‡Chicago Academy of Sciences, numbers 10992-11000.

Salvadora lineata Schmidt

A female, from eight miles north of Palo Pinto, Texas, deposited ten eggs on April 1, 1941. It had been caught during the fall of 1940 by Philip Harter, who found it under rocks in open pasture land, in what he took to be a mouse burrow. The early date of laying may be indicative of one of three things: that mating took place in the fall, that the snake mated with a male from the same locality which was caged with it, or that sperm from a previous mating remained viable and fertilized the eggs, ample evidence for the last possibility having been presented by Kopstein (1938) and others.

The female, which measured 741 mm. in length, was emaciated from failure to take food and died soon after laying. Measurements and weights of her eggs were:

Length, mm.	Width, mm.	Weight, g.
32.5	14.5	4.2
28.6	15.0	3.9
28.5	14.0	4.2
27.9	15.6	4.0
27.3	13.5	3.4
28.8	15.5	
28.7	14.7	
27.4	15.3	
24.3	15.4	
24.1	15.2	18.5 (last five ad- herent; weigh- ed as a unit)
Average	27.8	14.9
		3.8

Five of these eggs were adherent to one another. Probably all ten might have been adherent in a single cluster if the snake had not moved while laying. Each of the five eggs which were separate had one or more pebbles from the cage floor attached to it when the clutch was found.

The eggs of snakes of many genera, such as *Elaphe* and *Lampropeltis*, are coated with a fluid when deposited which, upon drying, serves as an adhesive binding the eggs together wherever they touch one another. Presumably the eggs of this *Salvadora* were similarly coated, although actual deposition was not witnessed. Snakes of other genera, such as *Coluber*, *Masticophis* and *Drymarchon*, lay eggs which are not adhesive. Furthermore, the eggs of the last three genera are covered with small, hard particles resembling crystals of salt in gross appearance. The eggs of this *Salvadora* lacked such nodules, the shells being entirely smooth.

Bogert (1939, p. 177) states that *Salvadora* is most closely related to *Coluber*, a view which, based upon comparative studies of scalation and hemipenes, is shared by most herpetologists. Stejneger and Barbour (1939) placed *Salvadora* after *Coluber*, *Drymobius* and *Drymarchon* (in that order) and before *Phyllorhynchus* and *Elaphe*, in their check list. It is of interest to note, therefore, that the eggs of *Salvadora*, at least in the case of the single clutch here reported, are much more similar to those of *Elaphe*, in the texture of the shells and in adhesive qualities, than they are to those of *Coluber*.

Four of the eggs spoiled but the others began hatching on August 4, 1941, and the last snake escaped from its shell on August 10; on the latter date four young still bore egg teeth. Measurements and weights of the young were:

	Length, mm.	Weight, g.
	253	3.2
	242	3.1
	239	3.0
	231	2.8
	227	3.0
	217	1.8
Average	234.8	2.8

The young were very active, crawling about the terrarium in which they were hatched and striking occasionally when disturbed. Sometimes, when held in the hand, they would vibrate their tails rapidly. Two of the young shed their skins on August 21, two on August 22, and one each on August 25 and 26. In coloration and pattern they closely resemble their parent, a fact which indicates further dissimilarity between snakes of the genera *Salvadora* and *Coluber*. The young snakes are now numbers 63571-6 in the collection of the American Museum of Natural History; the adult female is number 63578.

Natrix harteri Trapido

A female collected by Philip Harter, along the Brazos River, north of Palo Pinto, Texas (the type locality), on April 3, 1941, gave birth to seven young on September 24, 1941. Measurements and weights were as follows:

	Length, mm.	Weight, g.
	225	3.0
	215	2.9
	215	2.5
	213	2.8
	213	2.7
	211	3.1
	205	2.5
Average	213.9	2.8

The female measured 678 mm. in length and weighed 99.7 g. immediately after the birth of the young. All of the latter shed within twenty-four hours.

In pattern the little snakes agree with their parent and with the description of the species as given by Trapido (1941); in scutellation they fall within the limits as summarized by him. They are quite strongly marked, the dorsal spots being especially prominent; the spots on the lateral edges of the ventrals are fairly conspicuous. The largest of these specimens measured slightly less at birth than the smallest recorded by Trapido, who mentioned one nine inches (229 mm.) in length.*

Unlike Trapido (p. 679) I do not believe that "the almost unmarked belly presumably relates it [*harteri*] most closely to *Natrix erythrogaster*." On the contrary, after seeing these specimens, in addition to several others, both alive and preserved, I cannot help but believe that *harteri* is a member of the *sipedon* group of *Natrix*, rather than a close relative of *erythrogaster*. The following are my reasons:

1. *Natrix harteri* is a comparatively slender snake with its general body proportions approximating those of several members of the *sipedon* group. It is a small snake in comparison with *transversa* and *erythrogaster*; in both maximum and average size it is close to *Natrix s. compressicauda* and *N. s. clarkii*, the two smallest members of the *sipedon* chain of subspecies.

2. The head in *harteri* is small, long and narrow. The heads of both *transversa* and *erythrogaster* are proportionately larger and broader. Also, in both of these snakes the eye is conspicuously large; in *harteri* the eye is small and is comparable in size with the eyes of members of the *sipedon* group.

3. The maximum number of scale rows at midbody in *harteri* is 23, a characteristic which is shared by two members of the *sipedon* group, namely *compressicauda* and *clarkii*. The maxima in *erythrogaster* and *transversa* are 25 and 27, respectively.

4. There is no marked change in pattern and coloration with age in *harteri*; neither is there in many members of the *sipedon* group. Both *erythrogaster* and *transversa* undergo considerable change, notably *erythrogaster*.

5. *Natrix harteri* occurs in the same general region with *transversa*, although according to Trapido, it occupies another "niche." It is unusual to find two members of the same subgeneric group occupying the same territory and such would be the case if *harteri* and *transversa* are closely related.

*All are preserved in the collection of the Chicago Academy of Sciences: the female being number 11001, and the young numbers 11002-8.

The number of ventrals and subcaudals in *harteri* is high, and in this respect this snake averages closer to *transversa* and *erythrogaster* than it does to any member of the *sipedon* group. However, the maxima of both counts in *harteri* are exceeded in one or more of the subspecies of *sipedon*. Thus, according to Clay (1936), the maximum number of ventrals is 152 in *sipedon* and 153 in *insularum* (*harteri*=150); the maximum number of subcaudals in males is 89 in both *pictiventris* and *compressicauda* (*harteri*=86); the maximum subcaudals in females is 78 in *pictiventris* and 76 in both *fasciata* and *compressicauda* (*harteri*=76). Of the three forms of the *sipedon* group—*clarkii*, *confluens* and *sipedon*—which come closest to *harteri* in point of range, *sipedon* is the nearest to *harteri* in number of ventrals and subcaudals.

The almost unmarked pinkish belly of *harteri* does not necessarily relate this snake most closely to *erythrogaster*. In many specimens of *erythrogaster* the anterolateral portions of each ventral scute are marked with black or grey, and often this dark coloration occupies the major portion of each ventral. Such an arrangement is not unknown in *sipedon* and is common in *insularum* (Conant and Clay, 1937, p. 2). Many specimens of the latter have a uniform light midventral area of orange or pink of approximately the same shade and occupying approximately the same portion of the venter as in typical specimens of *harteri*. Certain specimens of *sipedon* also exhibit the same midventral coloration (Conant, 1938, p. 83).

The *sipedon* group as a whole is extremely variable in coloration and pattern and several of its members, which are known to be related through intergrades, show far more differences between one another than the differences which exist between certain of them and *harteri*.

Natrix harteri is a unique water snake and its exact relationships cannot be determined with accuracy on the basis of our present knowledge. The results of further collecting may well shed light upon its true status in the genus *Natrix*.

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